SOUTH AFRICA BEYOND KYOTO

Final Draft

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INTRODUCTION

South Africa signed the United Nations Framework Convention on Climate Change (UNFCCC) on 15 June 1993 and ratified it on 29 August 1997. It acceded as a Party to the Kyoto Protocol on 31 July 2002. Under both the Convention and Protocol, South Africa is recognised as a developing country. This means that it does not have any binding greenhouse gas reduction commitments but rather is required to report on its national emissions in the form of national communications and to the extent possible take into climate change considerations into account in the relevant social economic and environmental policies (UNFCCC, 1992). South Africa submitted its first national communication to the 9th Conference of Parties in Milan, Italy, December 2003. This First National Communications highlights the energy sector as the sector contributing the most CO_2 amounting to 287 851 Gg emissions in 1994 which represents 78 % of the total emissions, followed by the agricultural sector at 9.3 %, industrial processes at 8 %and waste at 4.3 %.

Discussions on the future of the climate process have started. With the Kyoto Protocol still not ratified and with less than four years to go to the start of the first commitment period, there is a need to examine the different scenarios in the event of non-ratification and thus implications for the multilateral policy process. While the much of the early discussion of future approaches has focused on the magnitude of reduction targets and optimal stabilisation goals, the role of developing countries in mitigation and how development goals and aspirations can be reconciled in this regard has received significant attention as well (Munasinghe 2001; Anon. 2003; Davidson et al. 2003; IIM 2003). South Africa like many developing countries has a role to play in the future process. Unlike the situation of developed countries whose future engagement may depart from an assessment of the adequacy of their existing targets, it is still unclear what can be demanded of developing countries and how this would be structured. Among the contentious questions are the timing for their involvement, the scale and nature of such involvement. Proposals for future scenarios have been based on qualitative as well as quantitative targets grounded on various allocation methods as well as negotiated schemes.

Since the eighth meeting of the Conference of the Parties (COP-8) to the UNFCCC, it has also become clear that significant funding and implementation of *adaptation* will have to be a central part of a second-generation climate agreement. The interlinkages between mitigation and adaptation reinforce the central role of achieving *sustainable development*, as a means of building both adaptive and mitigative capacity.

This study examines the potential for South Africa to contribute to the stabilisation of atmospheric greenhouse gas concentrations by establishing what future approaches it can be expected to undertake in the international policy process.

More specifically, this study strives to assess the prospects for engaging in future mitigation measures by examining the country's present situation, expectations from the current climate policy process including participation in the Kyoto mechanisms as well as a review of development goals and priorities. The underlying factors that could drive its future involvement are highlighted as a way of identifying means by which a process to support future actions to address climate change.

BACKGROUND ON SOUTH AFRICA

South Africa is a developing country located in the southern end of Africa. It has a population of about 43 million people, living on a land area of 1.2 million square kilometres. It is endowed with a spectrum of natural resources including minerals, ranging from coal to precious metals and stones. South Africa is the largest producer of gold and platinum in the world, the fifth producer of diamonds, and fourth producer of hard coal.

South Africa's past has been shaped by a history of apartheid. Since the democratic elections in 1994, the main development objectives of South Africa have focused on economic growth, job creation and access to key services (including housing, water, sanitation, transport, telecommunications, energy services and land reform) for the vast majority of its citizens. The country's development path was outlined in the ruling party's (African National Congress) Reconstruction and Development Programme (RDP) in 1994, whose main objective outlined was to meet people's basic needs, create job and achieve various sectoral objectives, such as connecting 250 000 households per year to the grid. The direction of government has been the promotion of social equity in the country and improvement on exports including capital goods. Since 1994, there has also been a new macro-economic development policy that has led to several national policy reviews in all key economic areas that have been followed by White Papers and new legislation. The 'Growth, Employment and Redistribution' (GEAR) strategy that replaced the RDP, was established in 1996 has a slightly different approach to macroeconomic policy, involving the reduction of the trade deficit, lowering inflation and lowering interest rates. This is with the intention of increasing rates of investment, economic growth and creating jobs. For the year 2003/2004, the South African government announced its intention to allocate substantial resources on a public works programme that would promote job creation. The main feature of the vision of GEAR was "a competitive fast-growing economy that creates sufficient jobs for all work-seekers," targeting at 6 % growth and the creation of 400,000 jobs per year. In order to achieve the employment goal, a minimum growth rate of 3 % per annum would have to be met.

South Africa is also the most industrialized country in Africa. The table below shows some key South Africa's development indicators in comparison to some other regions and the world.

Table 1: Key development indicators for South Africa and the world, 1999

Indicator	South Africa	Sub-Sahara Africa	World
Population	42.1mil.	643.3mil	6.0 bil.
Urban Population (% of total)	54.7	33.8	46.6
Paved roads (% of total)	20.3	12.3	45.1
Illiteracy – males, (% of males age 15+)	14.4	31.1	-
Illiteracy – females (% of females age 15+)	15.8	48.0	-
Energy use per capita (kg of oil equivalent)	2 596.6	671.2	1671.1
GDP (US $ billions)	130.2	319.6	30 700
GDP per capita (US $)	3 160.0	490.0	5 040.0
GDP Growth (annual %)	1.9	2.4	2.9
Agriculture share of GDP (%)	3.4	17.8	5.0
Industry share of GDP (%)	30.8	28.5	31.2
Manufacturing share of GDP (%)	18.8	-	-
Services share of GDP (%)	65.8	53.7	63.8
Total exports (US $ millions)	28 625	-	-
Total imports (US $ millions)	24 477	-	-

Source: World Bank

While GDP per capita lies below the world average ($3160 per capita compared to the global average of $5 040 per capita) this figure does not reveal much about the substantial gaps between the different races and income levels.

Energy Profile

South Africa has an energy intensive economy predominantly based on fossil fuels. Its economy hinges on energy production and use, with fossil fuels dominating more than 90% of the primary energy demand and mining. Coal provides 75% of the fossil fuel demand and accounts for 91% of electricity generation. The total primary energy demand is expected to grow on average by 3% per annum between 1993 to 2010.

The total net energy use in South Africa in 1997 amounted to 2.5 million Terra Joules (TJ), with industry and commerce accounting for the major part (45.1%) of the consumption, followed by the residential sector (16.4%), transport (27.5%), mining (6%) and agriculture (2.9%). Approximately 15% of the gross national product is spent on energy.

The Electricity Supply Commission (ESKOM), formerly a state-owned company, has been the national electricity utility that has been generating 96% of the total electricity supply, which meets 25% of the energy market. Presently

ESKOM is undergoing a restructuring process as part of the government strategy to privatise parts of the state owned companies , which would then be run by private companies, referred to as Independent Power Producers (IPPs). Of the total electricity generated, approximately 91% is derived from coal. ESKOM also owns and operates ten-coal fired power stations, situated near coal fields, one nuclear power station, two-pumped storage stations, a number of small-hydro electric power stations and a wind farm.

Nuclear energy is the second largest source of electric energy contributing 6.8% of the country's electricity generation capacity and 3% of the primary energy supply. Gas provides approximately 1.6% of South Africa's primary energy, whilst a portion of synthetic gas produced from coal through the synthetic fuel process is extracted and sold as pipeline gas. Renewable energy accounts for approximately 5.5% of South Africa' primary energy resources, this mainly refers to the biomass (wood, and coal) utilised by rural populations with limited access to electricity, and in some agro-processing industries constituting less than 1% of the total electrical energy used.

Table 2: Energy consumption and intensity indicators, 2000

	TPES/capita	TPES/GDP	TPES/GDP	Elec. consumption per capita (national average)
	Toe/capita	toe/000 1995 US$	Toe/ 000 PPP 1995 US$	kWh/capita
South Africa	2.51	0.63	0.29	4 533
Africa	0.64	0.86	0.32	501
South Korea	4.10	0.31	0.30	5 901
Indonesia	0.69	0.70	0.25	390
Non-OECD	0.96	0.74	0.28	1 028
OECD	4.78	0.19	0.22	8 090
World	1.67	0.30	0.24	2 343

Key: TPES = total primary energy supply, toe = tonnes of oil equivalent, PPP = purchasing power parity (i.e. adjusted to remove distortions of exchange rates), GDP = Gross domestic product
Source: IEA (2002)

Current statistics show that the South African economy is more energy intensive than some of the economies in the OECD. With over 90% of its electricity generated from coal, South Africa ranks as the single largest contributor to total CO_2 emissions from the African continent with approximately 44% of total emissions. Furthermore it is ranked the 19th largest emitter of greenhouse gases.[1]

[1] Rank numbers depend on the exact metric for emissions used. Based on annual GHG emissions in 2000, including CO2 (energy), CH4, N2O, PFCs, HFCs, SF6. Considering only energy CO_2, the

South Africa's energy intensity – the amount of energy per unit of economic output, and a function of both economic structure and the energy efficiency of individual sectors – is high (see Table 2). This is primarily due to the large share of energy-intensive activities within the economy, based on the historical development of the economy around the 'minerals-energy complex' (Fine & Rustomjee 1996). The relatively low energy prices encourages little efficiency. Nonetheless, South Africa has made improvements in some sectors, e.g. iron & steel, which are leading in the world.

Compared to an industrialising nation like South Korea, South African energy intensity is high per GDP, but similar if adjusted for power purchasing parity; and lower if adjusted to per capita consumption of primary energy (see figure 2). South Africa's intensity is more comparable to that of Indonesia, albeit at a higher level of primary energy and electricity consumption per capita. There is therefore room for energy efficiency improvements, when compared to other middle-income countries (Simmonds 1995; Clark 2000).

The energy sector has been a key factor in shaping South Africa's development path. Electricity supply, for example, was shaped by the demand from the mining industry as it emerged in the early twentieth century. In the 1950s, driven by concerns about energy security, the apartheid government decided to develop a synthetic fuels programme to meet demand for liquid fuels and lessen its dependence on energy imports. Massive power station projects initiated in the 1960s and 1970s (including local nuclear capacity), with the assumption of continued rapid increases in electricity demand, left the national utility with large excess capacity in the 1980s and 1990s. Excess capacity has helped to keep electricity prices low, although this excess capacity will be exhausted within the coming three to five years (ESKOM 2000).

Energy demand historically has been dominated by heavy industry and mining, which characterise the economic and energy structure of the country. Much of the manufacturing sector is also linked to mining activities through minerals beneficiation and metals production. All of these activities are energy intensive, relying heavily on the availability of inexpensive coal and electricity.

The presence of low energy prices, including coal-generated electricity, has been one of South Africa's key competitive advantages and continues to drive much of the new investment in industry. Since 1994, the focus has shifted to residential demand, with a primary energy policy objective being universal access to electricity and making energy services more broadly available to poor households.

Figure 1 shows the dominance of industrial and transport sectors for final demand. The non-energy category refers to resources such as coal, oil, gas and wood that could be used for energy but which are converted to other products like chemicals and paper (SANEA 2003).

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rank is 15th, but if LULUCF CO_2 were included, it is 19th again. For cumulative emissions of CO_2 energy from 1950-2000, South Africa ranks 14th (based on data from WRI 2003).

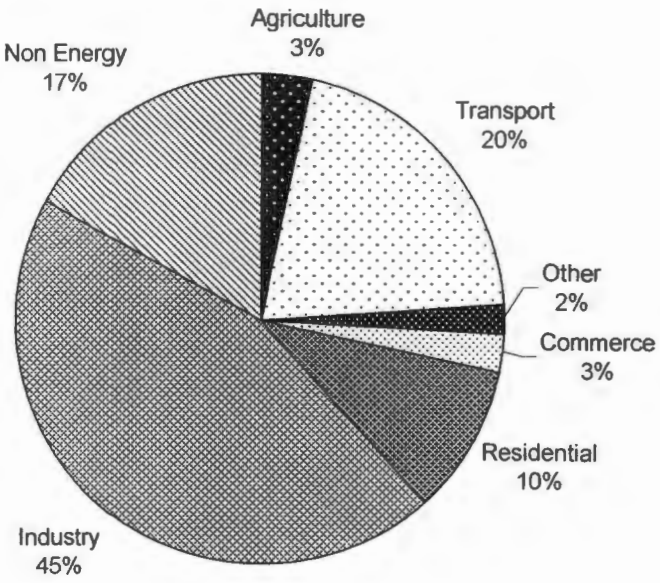


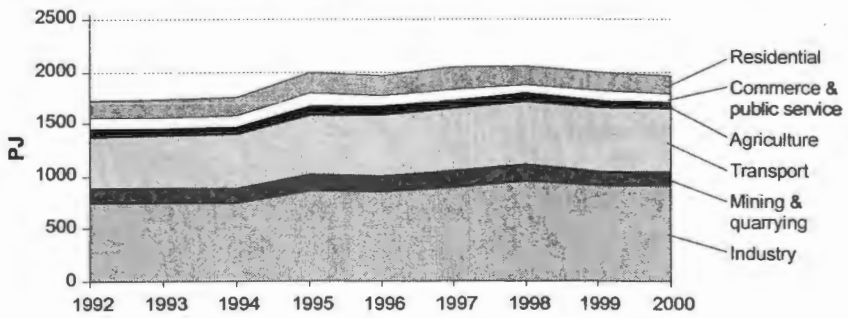
Figure 1: Share of final energy consumption, 2000

Source: Based on SANEA (2003)

Trends in the energy sector

In recent years, industrial demand has been the major source of growth across all energy carriers (see Fig 2). Some growth can be seen in the transport sector, while mining production declined slightly towards the end of the past decade.

Figure 2: Energy demand, 1992-2000



Note: This figure does not include consumption of renewables and waste, due to uncertainties in biomass data

Source: Based on data in energy balances (DME 2002)

A key change in the energy sector is the restructuring of the electricity sector. Different stakeholders have strong and often diverging views on power sector reform. These are summarised below.

Labour: The unions fears around restructuring are focused on privatisation and possible loss of services to poor communities. The Congress of

South African Trade Unions (COSATU) has repeatedly stated that it sees the corporatisation of Eskom opening the way to full privatisation, citing government's plans to sell 30% of Eskom shares (COSATU 2001).

Local government: The local government is concerned that restructuring will have a number of negative effects on municipalities. The South African Local Government Association (SALGA) has opposed aspects of restructuring. A key concern is loss of assets and income: if municipalities transfer their assets to the new REDs, how will they be compensated for the assets? A further point of contention is powers given by the Constitution. In terms of the Constitution, municipalities have executive and administrative authority over electricity reticulation. Municipalities have made clear their intention to challenge restructuring.

Industry: Restructuring offers opportunities for the private sector to invest in power generation, either through investments in new IPPs or through the privatisation of publicly owned ESI assets. The government can privatise through inviting strategic equity partners, targeted equity sales, auctioning assets or an initial public offering (Eberhard 2000:8). As investors, the private sector has much to gain from restructuring and generally supports it. Private sector participation is also linked to the goal of promoting black economic empowerment. As such, the government would encourage investments by appropriate companies, providing an avenue for previously disadvantaged communities and individuals to obtain greater control of the means of production.

Apart from being investors, the private sector also comprises the largest customers of Eskom. Large customers are organised in the Energy Intensive Users Group, a group that tends to favour choice through competition, since their bargaining power enables them to negotiate good tariffs.

South Africa's Emissions Profile

Reliance on coal energy sources is the main reason behind South Africa's high emissions. Coal-related sources of greenhouse gases in South Africa include electricity generation and production of synthetic liquid fuels. More than half of industrial energy consumption was derived from coal in 2000 (DME 2002).[2] The abundant supplies of inexpensive coal have provided a basis for large-scale coal-fired power stations and heavy reliance on coal within industry.

Table 3: Fuel combustion carbon dioxide emissions intensity and per capita, 2000

	CO_2/cap (tonnes/capita)	*CO_2/GDP (kg/1995 US$)*	*CO_2/GDP PPP (kg/1995 PPP$)*
South Africa	6.91	1.73	0.79
Africa	0.86	1.16	0.43
Non-OECD	2.24	1.73	0.64
OECD	11.10	0.45	0.51
World	3.89	0.69	0.56

Key: PPP = purchasing power parity, GDP = Gross domestic product

Source: IEA (2002)

The high emissions profile in industry stems from energy-intensive activities such as iron and steel, aluminium, ferrochrome and chemicals – the same sectors that make up a large share of South African exports. Other major emission sources include oil refining, coal mining and gas extraction, wood burning and the burning of coal and oil to produce heat.

[2] Approximately 57% of energy of final industrial consumption is attributed by the energy balance to coal; if one takes into consideration the coal-fired electricity share of 93% of electricity, the total reliance of coal is almost 90%.

Table 4: Source categories of emissions, 1990

Category	*Emission contribution (Gg)*	*Emission contribution (%)*
Electricity generation	137 333	37.7
Heat production	31 669	8.8
Other energy	25 492	9.9
Manufacturing	25 498	7.0
Transport	33 754	9.3
Agriculture	41 254	11.3
Waste	8 910	2.4
Industrial process	24 165	6.6
Fugitive emissions	36 146	9.9

Source: van der Merwe and Scholes (1998)

Because the specific energy efficiency of many sectors is also lower than average, emissions per unit of economic output are high – 45% higher than developing countries and 70% higher than the industrialized OECD (IEA 2001). The energy sector contributed 78% of South Africa's total GHG emissions in 1994 and more than 90% of CO_2 emissions (Van der Merwe & Scholes 1998). A summary of South Africa's total emissions in 1990 for major greenhouse gases indicates that it contributed 1.02% to total global emissions.

Table 5: Total emissions of GHGs by South Africa 1990

GHG	*Emission (Gg)*	*Emission contribution (%)*	*Total CO_2 equivalent amount (Gg)*
CO_2	303 054	81.5	303 054
CH_4	2 238	12.5	46 998
N_2O	77	6.5	23 870
Total			**373 922**

VULNERABILITY TO CLIMATE CHANGE

African countries, south of the Sahara are predicted to suffer the most impacts of climate change due to their natural vulnerability to climatic changes as well as due to the weak adaptive capacities of their economies (IPCC 2000). While South Africa on average has a higher adaptive capacity due to its well developed industrial sectors that is the mainstay of its economy, it will nonetheless suffer significant impacts on its natural ecosystems, society and associated sectors. To assess the possible effects of changing climate, a study was undertaken through the South African Country Studies programme. This study had the following objectives:

- to identify sectors and areas of highest vulnerability to climate change,
- to propose suitable adaptation measures to offset adverse consequences, and,
- to synthesise the results of the vulnerability and adaptation studies across sectors for analysis by policy or mitigation initiatives

Among the predicted impacts include changes in terrestrial and marine ecosystems, which will have profound impacts on agriculture, forestry, rangelands and fisheries, as well as on biodiversity (Kiker 2000; WWF-SA 2001).

Mean temperature increases in the range of between 1 and 3 degrees can be expected by the mid-21st century in South Africa, with the highest increase experienced in the most arid parts of the country. Such increases would be accompanied by a general reduction in precipitation thus increasing the incidence of droughts, prolonged dry spells, increased incidences of vector-borne diseases and waterborne diseases (*Schistosomiasis*), which would inadvertently affect the overall economic performance of the country. Vector-borne diseases like malaria, which ranks as the eleventh most frequent cause of death globally, are expected to increase as the projected climate change scenarios for South Africa predict an extension of malaria prone areas whilst a greater number of people exposed to the risk of malaria for longer periods of time due to the increasing length of summer is expected to increase. Rangelands will become more arid and agricultural output can be expected to decline. Studies on the impacts of climate change in southern Africa also show that 15% to 20% of the large nature reserves in the region would experience a change in habitat. Among those reserves to be affected is the Kruger Park, which is predicted to lose a significant amount of its species (Erasmus, et al, 2002). The biologically important wetland areas in South Africa that are vulnerable to climate change include the World Heritage Site at St Lucia, Knynsa, the Berg River and the Saldhana and Langebaan areas.

A rise in sea level, which could be as much as about 0.9m by 2100, would threaten low lying coastal areas such as parts of the Cape Flats. South Africa would thus suffer the greatest potential impact in the tourism sector, with a potential loss of up to up to 3% of GDP is at risk due to damages to its natural heritage (Turpie et al. 2002).

South Africa suffers from high water scarcity and it is predicted that even without climate change, it will utilise most of its surface water within a few decades. The impacts of climate change on the water resources sectors will mostly

be on the intensity and seasonality of rainfall, whereby with due climate change water scarcity and water quality deterioration are going to increase.

Maize is a staple food especially for low-income households in South Africa whilst most small scale farmers financially rely on the maize/grain sales for their sustainability and wellbeing. Maize production has also been highlighted as one of the key areas which will be affected by climate change. It is predicted that due to a hotter drier climate, maize production will decrease by approximately 10 to 20 % over the next 50 years.

Similarly, the forestry industry has also been highlighted as one of the highly sensitive industries and as it is mostly dependent on land and water availability. Thus with lower rainfall, higher air temperature and increased land degradation, shifts in the optimal tree growing areas could impact on the profitability of fixed capital investments in forestry industry.

Adaptation Options

A number of adaptation options have been identified in the National Communications report, to limit the adverse effects of climate change. They have been divided to include strategic resource management issues, drought relief measures, design of water infrastructure and communications, and they include,

- Rangelands (improved monitoring and forecasting system for fire hazard and drought)
- Agriculture (change in agricultural management practices, change in planting date, row spacing, planting density, cultivars choice, and other measures)
- Forestry (more temperature tolerant cultivars within the current tree species could be selected, genetic engineering could be used to develop more-heat and drought resistant hybrids)
- Biodiversity (management of the existing plant cover, maintaining animal diversity)
- Improved systematic observation and research is essential in order to further minimise vulnerability of SA to climate change.
- Increased inclusion of all stakeholders (education, training and public awareness) in all activities and processes related to climate change in SA

However, further analysis on (feasibility, costs and effectiveness) of these options prioritisation or indications on how they could be integrated into developmental planning have not been dealt with.

CLIMATE CHANGE GOVERNANCE: INSTITUTIONAL FRAMEWORK

The Directorate on Climate Change and Ozone Layer Protection within the Department of Environmental Affairs and Tourism (DEA&T) has the main responsibility for climate change and serves as the focal point for the UNFCCC and Protocol. With regards to climate change, its functions include to coordinate the gathering of information for the purposes of compiling and updating the national inventory, formulating programmes to mitigate climate change, monitoring of emissions, the dissemination of information and compiling the report to the Conference of the Parties. It also attends to initiatives and steps to promote the transfer of technology, sustainable management, adaptation methods, education, training and research. The Directorate also works to ensure that climate change considerations are incorporated in the sectoral policies of other government departments and undertakes education, training, awareness raising and capacity building. Two distinct levels of coordination to facilitate decision-making on climate change exist.

The *Government Committee on Climate Change (GCCC)*, which is an interdepartmental committee that addresses issues from a governmental point of view and the *National Committee on Climate Change (NCCC)*, which brings together the governmental actors and other nongovernmental stakeholders including industry, NGOs and academia.

The GCCC was established to advise the directorate on climate change and ozone layer protection on matters relating to national responsibilities with respect to climate change, and in particular in relation to the United Nations Framework Convention on Climate Change and the Kyoto protocol. It includes the Departments of: Agriculture; Arts Science Culture and Technology; Foreign Affairs; Health; Housing; Local and Provincial Government; Minerals and Energy; Trade and Industry (DTI); and Transport. This group meets prior to meetings of the NCCC.

Multistakeholder consultation is facilitated through the NCCC, which has a similar advisory function and mandate as the GCCC. It consists of representatives from the defined stakeholder groups involved in climate change, that is, the representatives of governmental departments, provincial governments, NGOs and community-based environmental organisations, business and industry and labour unions. Business is represented by a consolidated grouping, Business South Africa, as well as industry groups such as the Chemical and Allied Industry Association, Eskom, the Chamber of Mines and the Development Bank of Southern Africa (DBSA). NGOs and CBO's working on climate change issues are represented through the South African Climate Action Network (SA-CAN),. Academic groups include the Energy Research Centre (ERC), the Minerals & Energy Policy Centre (MEPC), the Council for Scientific and Industrial Research (CSIR), the National Research Foundation (NRF), Water Research Institute, National Botanical Institute and the Agricultural Research Council (ARC) among others. Among the issues taken up by the NCCC, include policy and a national

implementation strategy, communication of developments within the national and international climate change arena to local constituencies; and facilitation of processes for capacity building and technology transfer/ development.

The Department of Minerals and Energy has been pointed as the leading agency acting as the Designated National Authority (DNA) for the Clean Development Mechanism (CDM).

South Africa has developed a number of policies relating to climate change within the broader context of its national priorities. These are considered an integral part of the national sustainable development strategy (DEAT, 2003). Work is ongoing to elaborate a National Climate Change Response Strategy that presently is only available in draft form. The following is a listing of policies and measures relevant to climate change undertaken by the government of South Africa.

Environment: The National Environmental Management Act of 1998 has been amended to take into account changes, which have been made in legislation, with respect to pollution and waste management, environmental impact assessments and other environmental general issues. This Act aims at minimising and mitigating adverse environmental impacts and by so doing improving environmental management and facilitating sustainable development. The National Air Quality Management Bill will be the subject of a parliamentary workshop at beginning of February 2004.

Monitoring and research of the ozone layer, solar radiation, as well as measuring atmosphere trace gases and ozone depleting gases are undertaken by the South African Weather Services, whilst the Weather Forecasting Research Programme focuses on the consolidation of methods to evaluate and improve weather forecast accuracy. The Agricultural Research Council of South Africa with funding from the National Department of Agriculture is maintaining a number of databases that store and processes climatic data and other environmental parameters. The Department of Agriculture has a number of ongoing research projects which include effective water use in irrigation systems, generation of water saturation indices, water harvesting techniques for rural communities etc.

***Transportation*:** The transportation sector accounts for about 11% of national emissions. Projections for development in this sector show an average growth in the energy consumption in this sector which corresponds to an increase in the number of vehicles, decreasing car occupancy, traffic congestion and poor enforcement of traffic laws including speed restrictions (DEAT, 2003). The Department of Environmental Affairs and Tourism is currently formulating a Vehicle Emission Policy, outlining vehicle specifications for compliance with the requirements of unleaded petrol. The Department of Environmental Affairs and Tourism and Department of Minerals and Energy have also jointly released a draft implementation strategy with the new guidelines for regulating vehicle emissions at the end of 2004. The strategy will give effect to provisions in the new air quality management legislation, and aims to implement clearly defined standards for vehicle exhaust emissions and appropriate fuel specifications.

Energy Sector The Department of Minerals and Energy has also passed the Renewable Energy White Paper. The Renewable Energy Strategy is currenly

underway with a task team being set up to draft the strategy, a first draft is due to be completed by February 2004. The White paper sets out five policy objectives i.e. increase accessibility to affordable energy services, improve energy governance, stimulate economic development, diversify energy supply and management of energy related impacts.

In 2003, the Energy Regulator Bill was also approved by the Cabinet. This Bill relates to the institution of a single National Energy Regulator to replace the current regulatory structure for electricity, gas and petroleum.

With regards to renewable energy, the Departments of Arts, Culture, Science and Technology, Minerals and Energy and National Treasury, have also launched a probe into aspects of commercial production of bio-diesel with a focus on the economic effect of making and using bio-diesel, "energy considerations" and marketing environmentally friendly fuel. The Department of Science and Technology (DST) has also been investigating the viability of the bio-diesel industry in South Africa. In partnership with the National Treasury, Department of Minerals and Energy and Department of Trade and Industry, the DST in 2003 commissioned research from the CSIR on the commercial aspects of bio-diesel production in South Africa. DST now has ownership of the completed study report, which looks at the technical, economics and agricultural issues surrounding the production of bio-diesel in South Africa. Feasibility studies are ongoing on the possibilities of using national gas from the Kudu gas fields in Namibia (DEAT, 2002).

Waste Management: With over 50% of the population not having access to solid waste management services, waste management has been identified as a national short term priority (DEAT, 2003). In the White paper on integrated pollution and waste management of 2000, the focus is placed on pollution prevention rather than on remediation and impact management. The strategy gives priority to waste minimisation and recycling before resorting to treatment and disposal.

Agriculture and Forestry: The Conservation of the Agricultural resources Act (Act 43 of 1983) provides for control over the utilisation of the natural agricultural resources in order to promote soil and water conservation and combat the spread of invasive species. With regards to forestry, the Department of Water Affairs and Forestry is pursuing a reform programme in the forestry sector aimed at leasing State-owned forest land to private-sector operators and in so doing moving from the management of plantations towards promoting, regulating and developing the forest industry. The White paper on Sustainable Forest Development and the Government policy on national unity deal with all aspects of the forestry sector, including indigenous forests, woodlands, industrial forestry, community forestry and human use of forest resources. The National Forests Act of 1998 provides a framework for the development of principles, criteria, indicators and standards for sustainable management. The National Veld and Forest fire act (Act 101 of 1998) aims at preventing and combating veld, forest and mountain fires (DEAT, 2003).

Policies relating to Adaptation and Vulnerability: The government of South Africa defines disaster management as a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures

aimed at preventing or reducing the risk of disasters; mitigating the severity or consequences of disasters; emergency preparedness; a rapid and effective response to disasters; and post-disaster recovery and rehabilitation (DEAT, 2003). As stated earlier, the impacts of climate change will be most evident in the effects on the hydrological resources of South Africa. In 1999, a water conservation and demand management policy was adopted. This policy includes both voluntary as well as mandatory measures for water conservation and aims at ensuring efficient water use. The Department of Water Affairs and Forestry have released a National Water Resource Strategy for comment. This strategy will include the analysis of the impacts of climate change on South Africa water resources, which will be lead by the Water Research Council. In order to manage water related disasters effectively, the department contributed to the national disaster management policy that outlines strategies to deals with disasters and minimise risk.

Disaster management falls under the jurisdiction of the Minister of Provincial and Local Government. The White paper on disaster management recognises the link between development planning and the country's vulnerability. In January 2003, the government approved the Disaster Management Act that establishes a National Disaster Management Framework. This framework aims at providing a coherent, transparent and inclusive policy on disaster management appropriate for South Africa by guiding the development and implementation of the concept of disaster management; promoting prevention and mitigation, regional cooperation and cooperative governance. Furthermore, it provides for implementation of disaster management across the government and facilitates stakeholder participation. A Disaster Management Bill (B21-2002) is being currently being discussed by the National Council of Provinces.

BEYOND KYOTO - SOUTH AFRICA AND INTERNATIONAL ACTIONS ON CLIMATE CHANGE

South Africa in the international negotiations

South Africa as a signatory of the UNFCCC has been involved in the international climate change debate for over a decade. Since it became a party to the Convention, South Africa has been represented at all negotiations sessions and has played an active role in the Africa group as well as in the group of developing countries, known as the Group of 77 & China (G-77/China). South Africa has taken on the role of issue coordinator for the Group, on a number of issues over the years, including compliance, mechanisms and on Articles 5, 7 and 8 communications, and reporting review.

At the Ninth Conference of Parties held in December 2003, the South African: delegation comprised of representatives of the following departments and interest groups.

- Department of Minerals and Energy,
- Department of Agriculture,
- Department of Environmental Affairs and Tourism,
- Department of Foreign Affairs,
- Private Sector, and ,
- Non-governmental organisations (NGO)

The Chief Climate Negotiator appointed by DEAT was the leader of this delegation. Positions taken at the COP(s) (including COP 9)are taken through a wide process of stakeholder consultation which includes consultations through the GCCC as well as the NCCC. The South African delegation followed closely negotiations on Article 4.5 of the Convention (Development and Transfer of Technology), Articles 4.8 and 4.9 (adaptation and vulnerability), Article 12 of the Kyoto Protocol (Clean Development Mechanism), the Special Climate Change Fund, Research and Systematic observation, Good Practice guidance on land use, land use change and forestry (LULUCF), and definitions and modalities for including afforestation and reforestation activities under the Clean Development Mechanism

At this Conference of Parties, South Africa worked closely with the both the Africa Group and the G-77/China, and one of its members, John Kilani (industry) was nominated by the Africa group as a member of the CDM Executive Board.

One of the few obstacles observed from this COP was that even though the delegation had the capacity to tackle issues/topics at this level, it took time for the negotiators to engage in the negotiations or in working with other more experienced negotiators (especially from the Africa Group and the G-77) for several reasons.

Firstly, many of the negotiators were attending the COP for the first time and thus were new to the process. Furthermore, many of them had not been

involved in presessional meetings and thus were not fully appraised of the progress made on possible deals within the larger coalition groups prior to the formal negotiations.

At the national level, the interaction amongst different government departments at national level (Government Committee on Climate Change) remains weak and thus co-ordination of issues concerning different government departments at national level is inadequate. The weak capacities of the departments that are the main role players in the climate change debate has been cited as the main concern by most of the stakeholders. This has led to inconsistency in the representation of South Africa at the COP and in other pre-COP meetings due to the high turnover of delegates. This can also be related to the weakness of the GCCC and the NCCC.

Nevertheless, South Africa has managed through the various negotiating coalitions to articulate its interests in the process and provide leadership on some of the key issues of concern to the developing countries.

ASSESSING OPTIONS FOR FUTURE ACTIONS

Implications of Different Allocations and Baselines for South Africa

As the commitment period beyond Kyoto draws closer, the question of how developing countries might participate in addressing climate change becomes urgent. Participation in the form of taking on commitments can take two forms, it can be ether based on an allocations approach, based on certain principles and defined criteria and which can be considered as top-down, or pledge based which draws on the initiative of individual or groups of countries (bottom up) (Winkler, et al, 2002a)

According to the UNFCCC, the protection of the climate system should be based on equity and in accordance with Parties common and differentiated responsibilities and respective capacities. Drawing from these, three clear principles, equity, capacity and responsibility (historical or projected) are expected to form the basis for the definition of any schemes to address climate change. Developed countries are thus expected to lead the process of mitigating climate change, while developing countries have not had any concrete commitments but rather have a responsibility to ensure that processes are in place to support and nurture sustainable development.

According to Winkler et al.(2002b), targets for greenhouse gas emissions can be viewed both from perspective of entitlements to emit as well as the targets for reduction. Developing countries have often argued for their right to continue their economic and social development and thus a right to use the absorptive capacity of the atmosphere. They argue that the developed countries had their chance when they industrialised and thus are responsible for the major part of the emissions causing the present situation.

With regards to future participation of developing countries, some have argued for a gradual process of graduation to binding commitments. By graduation one implies that the larger more developed countries of the South would take on targets (either binding or voluntary) of a particular nature before the poorer developing countries. Such commitments could be based on more or less the same principles alluded to in the UNFCCC, notably 'common but differentiated responsibilities and the principles of Article 3. Developing country commitments could therefore be of either a qualitative, based on policy improvements and coordination or quantitative nature, involving absolute targets that are binding or non binding, (see for example Winkler et al, 2002a; Winkler et al, 2002b; Baumert, et. Al, 2002; Bodansky, 2003, Naturvårdsverket, 2002).

Quantitative targets under discussion include the following.

- *Allocations of emissions entitlements*. Entitlements can either be per capita, or on the Convergence and Contraction formula proposed by the Global Commons Institute. Per capita entitlements are based on the notion of equitable resource sharing on elaborates on the proposition that each person has the right to emit and equal amount of greenhouse gases (Aslam, 2002). The contraction and convergence proposal was developed by the Global Commons Institute (also see Global Commons Institute

http://www.gci.org.uk/). Contraction means that the global emissions would not exceed a certain global target, while convergence refers to national emissions entitlements that would converge at an agreed date at equal per capita emission entitlements for all countries. (Naturvårdsverket, 2003). Thus emissions for countries would contract over time to lower levels as well as converge to equal per capita entitlements for all countries. (Winkler et al. 2002d)

- *Allocations of emissions reductions based on historical responsibility.* Most notable in this discussion is the Brazilian proposal to allocate emissions reductions based on the contribution a country has made in terms of the accumulated contribution to temperature increase since the industrial revolution. This proposal is based on the polluter pays principle (Baumert, et al, 2002) and is an attempt to interpret the reference to common but differentiated responsibilities as stated in the Convention.
- *Allocations of emissions reductions based on capacity.* The conventional indicator of the ability to pay in GDP per Capita, which address to a certain degree the criterion of need and perhaps indirectly that of responsibility (Naturvårdsverket, 2003). In a similar way as allocations based on historical responsibility, those based on such a formulae lays a large part of the responsibility on the industrialised countries, which are also those with high per capita incomes and thus favours developing countries.
- *Allocations of emissions reductions based on emissions intensity.* Intensity targets are formulated relative to economic output. Thus emissions intensity can be defined as a certain level of emissions per unit of GDP.
- *Allocations based on negotiated targets.* The quantified emissions reduction targets that form the basis for the Kyoto commitments were not based on any specific formulae but rather were negotiated taking into consideration the various interests and national circumstances of Parties (Naturvårdsverket, 2003). Often such targets are conditioned more by political considerations than on scientific facts and information. While this is the most likely alternative in most multilateral negotiations, the availability of better science and thus better projections for future trends, broadens the scope for such targets by opening up for more convincing arguments.

According to Winkler, et al (2002b) any scheme based on entitlements, be they per capita allocations or allocations modelled under the contraction and convergence scheme, does not favour South Africa due to its high per capita emissions. In general, South Africa would fare worse than other larger developing countries, like China or India, that have larger populations or lower emissions intensities.

In the case of allocations of emissions reductions, Winkler et al. (2000b) draw different conclusions. If the reductions are premised on the emissions intensity, then South Africa would be required to make larger reductions pretty early, than if they were premised on its ability to pay, as measured in GDP per capita.

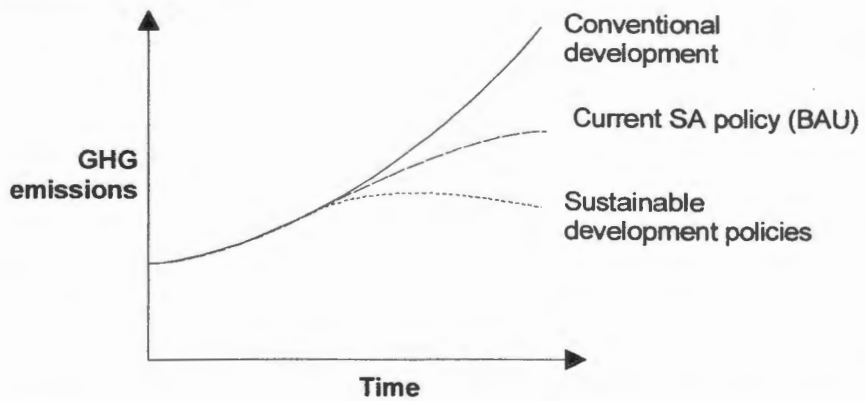
However, when based on historical responsibility, then South Africa like most of the other developing countries would not be required to make any reductions or make rather marginal changes. As regards negotiated targets, the outcome is often contingent on the capacity of the Parties to negotiate and make deals that are favourable to itself. Its negotiations capacity is also a function of the overall power play in the process, with those that wield more power managing to assert their self interest in many areas.

For negotiated targets to work in favour of South Africa, the role of the coalitions to which it belongs comes into focus. How effectively the Group of 77 and/or the African group can make their case will determine the fate of the developing countries in general.

Qualitative targets: These are pledge based targets that focus on policy implementation (Winkler, et al 2002a) and/or policy coordination (Naturvårdsverket, 2003). While such targets may appear to be more difficult to quantify and monitor in the short term, they are envisaged to result in broader and more far reaching effects that may have longer term impacts on the emissions trends in a country. One such approach is the sustainable development policies and measures (SD-PAMs approach). According to Winkler et al. (2002a), such an approach recognised the political reality in many countries where climate change is not accorded high priority due to how its perceived. By addressing other priority sectors, ancillary benefits to addressing are indirectly achieved, while at the same time keeping development priorities and aspirations in focus.

The SD-PAMs approach thus builds on exploiting synergies between development objectives and needs and climate change abatement.

Figure 3. Current South Africa policy in relation to conventional and sustainable development



Source: Winkler et al, 2002. Sustainable Development Policies and Measures (SD-PAMs) Tackling Climate from a Development point of view

While SD-PAMs offer a rational approach to addressing climate change in the long term through mainstreaming and integration into development and economic programmes, its realisation is faced with a major challenge. Financing SD PAMS requires large amounts of resources. Currently existing funds under the climate convention and through the CDM can be channelled to projects (CDM),

enabling activities (GEF) or policy changes (e.g sectoral CDM). Funding SD PAMs requires that resources are drawn from a combination of sources such as bilateral aid and multilateral institutions, foreign direct investment and domestic investments (Winkler, et al, 2002). In general SD-PAMs can be funded using development assistance and other resources available for development programmes in the country as well as foreign direct investment, when undertaken by the government as part of a future commitment strategy.

SD-PAMs could also provide an input to sector wide initiatives that could take the form of a kind of sectoral CDM programme. However, when regarded as possible CDM programmes (that is CDM applied on a sectoral scale) then the condition that exempts the use of ODA comes into play. A creative framework for mobilising funds and coordinating in such a way as not to contravene existing rules and guidelines (especially where SD-PAMs become part of a CDM strategy) is therefore a necessary prerequisite to the success of such an approach. Utilising SD-PAMs on this scale could provide an impetus to a transitional process for future action.

The following are examples of SD-PAMs. While they are framed in more or less the same way development objectives tend to be framed, they are in essence policies that result in long term mitigation of greenhouse gases and thus address climate change.

A target of renewable electricity generation providing 15% of supply to grid. Electrification of rural areas is one way of extending access to energy to local communities (Winkler et al, 2002) Coupling electrification efforts with opportunities for the introduction of renewable energy into the grid, allows for two goals to be met, i.e. development and mitigation. The NGO community in South Africa have called for a renewable energy target of 25%. The South African currently aims at generating 4% of the national grip supplied power from renewable technologies (DME 2003) . This has been included in the final White Paper on renewable energy that has recently been published.

Production subsidies for renewable electricity. While opportunities exist for independent power producers to sell renewable energy on the market, the current structure of the market makes it difficult (Winkler & Mavhungu 2002) and thus increases the costs for renewable energies and thus affects their competitiveness on the market. The provision of subsidies would provide an inroad and motivation for more producers especially in the private sector to venture into the energy market, over time lowering the generation costs.

Energy efficiency in low cost housing (Winkler et al. 2002e) as well as mandatory codes and standards for energy efficient buildings in government, commercial and residential sectors. Housing and infrastructure development is a major priority in South Africa, as well as in other developing countries. The growing populations exert a growing demand that in many cases is hard to meet. More often, the standards for housing and construction are lowered to a basic minimum in order meet this demand. However, this sector also offers a major opportunity to energy savings if the standards are raised a notch higher and the planning integrated with that in the energy sector. Improving insulation and lighting, for example through design and material

considerations will increase the costs marginally while reducing energy consumption significantly.

Table 6. Changes in carbon dioxide emissions for selected SD-PAMs in South Africa

SD-PAM	*Sustainable development benefits*	*Percentage of CO_2 emissions, 1999*	
		Sectoral	*National*
National electricity efficiency improved by 5% (2010)	39 000 additional jobs R800 million additional income	N/a	-2%
End-use Energy efficiency (2010)	Energy savings and load management by utility	5% of CO_2 from electricity	-2%
Increased share of cleaner electricity of 5% by 2010	Reduced local air pollution and fuel costs, increased diversity		-3%
Poverty tariff	Savings on electricity and lighting and entertainment services from free electricity of 20 – 60 kWh / household / month for 1.4 million poor households	+1.6% of residential CO_2 emissions	+0.2% (upper bound estimate)
Energy efficiency in low-cost housing	Household energy savings, reduced indoor air pollution, improved health and increased levels of comfort	-0.6% to – 7% of residential CO_2 emissions	-0.01% to -0.2%

Note: The latest estimate of SA's total GHG emissions is for 1994, so more recent emissions data in used which includes CO_2 only. CO_2 contributed more than 80% of SA's total GHG emissions in both the 1990 and 1994 inventories.

Source: Winkler et al (2002a)

STAKEHOLDER VIEWS

A small group of South African stakeholders from government, business and civil society were interviewed to establish which of the different future approaches would be most acceptable from their different points of view. In general, framing future involvement in terms of approaches to address sustainable development was popular across NGOs, business and government.

Environmental NGO's welcomed the SD-PAMs approach, although they have in the past also supported the Contraction & Convergence (C&C) approach (Meyer 2000) (e.g., the Environmental Justice Networking Forum, a coalition of NGOs). These groups tend to distinguish between bottom-up approaches driven by sustainable development and a global cap on emissions or sharing the burden of a global reduction. A separate legal instrument would be needed for any global emissions target, whether based on C&C or other approaches such as the Brazilian proposal. However, the SD-PAM-type approaches are considered useful as a transitional instrument. It may help developing countries move beyond the fear of international targets as a threat to their development priorities. Concerns about the overall environmental integrity of the climate change regime, however, lead this group to support ambitious targets.

The South Africa business community saw sustainable development as a helpful framework. They felt that the business community could relate more easily to this framework than to targets set in terms of climate change. Policy conflicts between climate change and development objectives are avoided; a argument that is sometimes used as an excuse for inaction. However, there is also substantial scepticism and resistance to any form of targets (in most cases those of a quantitative nature) among the business community. The fear is that South Africa business would be hard hit, especially in energy-intensive sectors. Industries that are dependent on coal are particularly sensitive to this issue, and tend to be cautious about any discussion of future commitments. There is also concern about the role of government in negotiating *any* kind of targets, and then 'allocating them down'. Business tends to prefer voluntary approaches; or government should set goals, but let industry advise on how those goals might best be met.

Within the South African government, approaches that focus on sustainable development and climate change are considered more favourable. The sense is that these can be appealing to many developing countries, being a 'win-win' approach. South Africa, like most developing countries, is already committed to sustainable development, in particular implementing the Johannesburg Programme of Implementation from WSSD. Indeed, government is looking for resources to accelerate this shift, through e.g through bilateral CDM funding, the Prototype Carbon Fund, and other sources of funding for implementation of renewable energy policy.

As with business, however, there is a range of views in government, with some believing that South Africa should continue with the existing G77 position of no commitments beyond 'no regrets' measures. Interestingly, this is partly

related to the prevailing differences in how *equity* is interpreted among the developing countries. While other countries (e.g. India) have promoted the per capita approach as equitable, allocations on this basis were seen as unrealistic for South Africa. Fairness requires that countries can develop (sustainably), so that sustainable development needed to be built into the definition of equity.

In general, the issue of developing country commitments was considered a sensitive one, with the perception still existing that any talk of 'commitments' might reflect interests of industrialised countries to pressurise large developing countries to cut emissions. In some parts of the South African government, climate change is still perceived primarily as a risk – to coal exports, to the competitiveness of energy-intensive industry and even to continuing to extend access to affordable energy services to the poor.

The SD-PAMs or sectoral CDM approaches were seen as a realistic first step by some in government. Later, when the impacts of climate change were felt, a shift to a stronger response might be possible. Government may be more open to discussing these issues, but there is a strong feeling that the initial discussions must be among South Africans (before the country can go public). A workshop with the NCCC might be a useful way forward, but results would have to remain confidential.

RECOMMENDATIONS FOR ACTIONS TO SUPPORT FUTURE ACTIONS IN SOUTH AFRICA

In considering what aspects to support, it is necessary for any donor agency to review existing bi-lateral and multilateral funding and its focus areas, and concentrate on areas not yet supported, or capable of using additional funds. South Africa has a well developed policy and institutional infrastructure that provides a good basis for the development of programmes that would enhance the efficient and effective use of resources. The following are a number of priority areas that have been identified through consultations as well as from previous studies, policy documents and other relevant literature, that could be supported as a way of preparing South Africa to undertake future actions on climate change.

Investment in a variety of CDM projects especially in the energy sector, for example, energy efficiency in the residential sector (housing, solar water heaters, buildings, etc) and industry and renewable energy (market development). Of particular interest are CDM project activities that link global climate benefits with poverty alleviation and infrastructural access and that can be replicated on a larger scale.

Support to planning processes to ensure mainstreaming of climate change concerns into development programmes. One of the most effective means would be through the strengthening of *institutional* capacity in departments other than the climate change focal point only. Such support would be channelled to the line function departments dealing with the impacts of climate change, as well as those primarily responsible for mitigation. Concretely, this could take the form of funding the training and salary costs for a number of years for a given post /person of a person in each of the Departments of Agriculture, Water & Forestry, Health (adaptation) and Minerals & Energy, Housing, Trade & Industry, and Science and Technology.

Further support to enhancing the climate change infrastructure through institutional capacity building can be targeted at climate change related education, as well as short term training for policy makers and negotiators. This could tackle the form of facilitated workshops for coordination purposes, climate change related education and short term training for policy makers and negotiators. Support to national planning processes would ensure that climate change issues are incorporated into South Africa's developmental goals and as such enable government departments to achieve their service delivery objectives while addressing climate change i.e. through so-called "win-win" or "no regrets" measures.

Support to improve research capability by bolstering the research staffing, training of junior scientists, and providing project support. This could include improving early warning capability (centred around the South African Weather Service); training of agricultural extension officers on the interpretation, understanding and dissemination of weather and climate information to farmers and rural communities and thus improve their capacity to adapt to a changes in the climate patterns; support for the dissemination of forecast or warning information.

(the Department of Agriculture currently has a section/directorate titled Disaster management, Research and Systematic Observations)

Support to Adaptation Programme outlined in National Communications South Africa in its first initial national communications and the country study programme has highlighted its adaptation options, thus further prioritisation or indication of how they could be integrated into SA developmental planning/sustainable development goals has not been dealt with. This will also start with a review of adaptation country programmes in place if any, their status, identification of gaps in these programmes and analysis of further developments/might be project led programmes which will assist in attaining adaptation-mitigation type goals if possible.

Capacity Building to strengthen long term in country capacity in the climate change negotiations. Such support it essential to ensuring that negotiated agreements reflect the political realities and can thus be implemented effectively. Invariably, the weak capacity of developing countries works against the global policy process and thus results in outcomes that are not measurable to the level of ambition or interest of the countries. There is therefore a need to reinforce the capacity of the developing countries to understand and better articulate themselves in the climate change process. This requires an enhancement of the analytical capacity of the developing country delegations in general and that of South Africa in particular, especially with regards to their ability to introduce new proposals for future actions under the UNFCCC and Kyoto Protocol framework

CONCLUSION

The participation of developing countries in future actions on climate change will be needed if dangerous climate change is to be avoided. The form such participation will take will depend on the extent to which mitigation approaches are integrated in development objectives. To many developing countries, future commitments based on quantified emissions reductions targets are perceived as limiting and thus a threat by industry as well as some government officials.

Almost any 'top-down' target would be hard to meet for South Africa given its current high emissions intensity and pressing development priorities. Regardless of the future scheme that is chosen, South Africa has to address its high emissions intensity, which requires a long term transition process to take into account communities dependent on fossil fuels (Winkler, et al 2002b).Winkler et al. (2002) argue that while their high emissions intensity would make the country vulnerable to any instrument that targets carbon, it also provides opportunities for investment in mitigation. Such investments would however have to be channelled over a long term and on a broad base, preferably targeting whole sectors rather than projects.

As seen from the case of South Africa, the sustainable development policies and measures approach (SD-PAMs) is not only an attractive option but also the most likely approach acceptable to a majority of developing countries. Not only does such an approach take into consideration their national

circumstances but also provide more "carrots" than "sticks" to motivate their involvement.

In practice, the SD-PAMs approach could also function as a sector wide CDM programme. It would be driven primarily by local benefits – social, economic and environmental benefits to the country.

The approach is also consistent with South Africa's Initial National Communication (RSA 2000), which builds SA's response to climate change around sustainable development. However, such an approach requires substantial support from the international community. There is a need to coordinate both domestically and within multilateral institutions efforts that would have synergistic benefits and thus tailor financing accordingly.

The use of the CDM is a suitable starting point. While the CDM operates presently on a project by project basis, the potential for large scale replication should not be understated. CDM projects can serve to showcase new and improved technologies as well as means of overcoming barriers to their implementation. Sectoral CDM would therefore mean that interventions would not be limited to a particular project but formulated on a broader basis. This requires significant cooperation and communication between responsible authorities and other stakeholders (beyond the climate change circles) both in investing and host countries.

Involvement of developing countries in future actions is also contingent on the availability of information and research on future trends and priorities and the timely engagement of stakeholders in planning discussions. It is therefore imperative that the research and development capacity of such countries is supported to ensure that planning processes are forward-looking and draw upon different scenarios to ensure best practices. Dialogue with stakeholders across different sectors should be supported to ensure a high level of awareness and engagement.

South Africa as a young nation has the potential to provide instrumental leadership in implementing sustainable development policies. It has already in place strong institutional structures that need to be supported to ensure that the professional and social cultures cultivated within them nurture sustainable practices that are not only beneficial for the local populations but result in global benefits.

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SOUTH AFRICA BEYOND KYOTO

Final Draft

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